Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) An internet protocol over wavelength division multiplexing (WDM) network structure comprising:

a plurality of sub-rings each for ~~connecting~~ accommodating n number of terminals (where n is a positive integer) ~~to which unique link wavelengths are respectively allocated~~;

a main ring ~~for connecting m number of the sub-rings (where m is a positive integer) via a respective connection node to which unique link wavelengths are respectively allocated~~ having m number of connection nodes (where m is a positive integer), each of the connection nodes connected to a sub-ring via a sub-ring controller;

a sub-ring controller for connecting an associated sub-ring to said main ring through the connection node, and controlling the flow of packets inside said sub-ring and the flow of packets between said sub-ring and said main ring, ~~the sub-ring controller using a unique wavelength that is different from the unique wavelength used in the terminal and connection node, the wavelength used in the main ring configured for use in each sub-ring~~; and

a main ring controller for controlling the flow of packets inside said main ring,

wherein all the sub-ring controllers share information on IP addresses of all the terminals connected to the entire network and a wavelength allocated to the sub-ring to which its IP address belongs and communicate with the main ring controller that manages the sub-ring controllers using different wavelengths

wherein all the terminals connected to a given sub-ring communicate with corresponding sub-ring controllers using different wavelengths, respective terminals communicate via the sub-ring controllers each of which is connected to the sub-rings, respectively.

wherein said terminals and connection nodes each add/drop only their own unique wavelengths,

said sub-ring controller configured to drop all ~~the~~ wavelength division multiplexed signals flowing in the sub-ring itself to de-multiplex the signals, a) to load each of said signals on a unique ~~link~~ wavelength assigned to its terminal by using a destination address that is included in the packet, and then multiplex again said signal to transmit to said sub-ring when the destination terminal is located on the sub-ring of itself, and b) to add ~~the~~ an identifying code (which is called a λ-tag) designating the sub-ring having a destination terminal of the packet, load the packet on its unique ~~link~~ wavelength assigned between said sub-ring controller and the main-ring controller, and then transmit it to the connection node of said main ring when the destination terminal is located on the sub-ring other than the sub-ring having the source terminal of the packet,

said main ring controller configured to drop all the wavelength division multiplexed signals flowing in the main ring itself, extract the λ-tag information, switch incoming packets based on the λ-tag information, load packets on their unique wavelengths assigned to the respective sub-ring controller, and then transmit packets to the main ring,

wherein said main ring controller switches the packets extended by an wavelength socket scheme in which a buffer storing the packet, a lead frame framing the packet to be suitable for being transmitted and a transmitter converting the packets into optical signals are provided for each wavelength, and

each sub-ring controller and the main ring controller configured to transmit signals only in a uniquely defined direction.

2. (Previously Presented) The internet protocol over WDM network structure according to claim 1, wherein the maximum number m of the connection nodes in said main ring and the maximum number n of the terminal in one sub-ring are the same (m=n), so that the n number of wavelengths ($\lambda_1 \sim \lambda_n$) assigned to each of the sub-ring in the main ring for connecting the respective sub-ring controller to the main-ring controller, and the same n number of wavelengths ($\lambda_1 \sim \lambda_n$) assigned to each of the terminal in a given sub-ring are fully reusable,

resulting in the n^2 number of terminals being interconnected by using the n number of wavelengths ($\lambda_1 \sim \lambda_n$).

3. (Canceled)

4. (Previously Presented) The internet protocol over WDM network structure according to claim 1, wherein each terminal and connection node includes a wavelength coupler to add/drop only the assigned wavelength, said wavelength coupler including an input circulator, a fiber Bragg grating for reflecting a unique user wavelength from a corresponding terminal and for passing other wavelengths, and an output circulator,

said input circulator transfers the wavelength division multiplexed signal inputted via said sub-ring to said fiber Bragg grating and drops the unique user wavelength from the corresponding terminal, that is reflected by said fiber Bragg grating,

said wavelength coupler adds the same wavelength as dropped at the input of the wavelength coupler.

5. (Currently Amended) The internet protocol over WDM network structure according to claim 1, wherein the sub-ring controller comprises:

a sub-ring managing section including:

a de-multiplexing means for dropping the WDM signals flowing in/from said sub-ring and for dividing them into individual wavelengths;

a routing means for routing the packets in the de-multiplexed wavelengths according to their destination terminals, using the destination terminal address included in the packets;

a packet grouping means for grouping the packets that have the same destination terminal;

a wavelength allocating means for loading said packets grouped by each of the destination terminals on the unique ~~link~~ wavelengths of said destination terminals; and

a wavelength multiplexing means for multiplexing all the wavelengths into a single fiber of the sub-ring so that WDM signals containing the packets are transmitted to the destination terminals in the sub-ring, and

a main ring managing section including:

an optical receiver for receiving the unique ~~user~~ wavelength signal from said main ring through the connection node attached to the receiver;

a reframe means for synchronizing said received signal and for receiving the packet including CRC (cyclic redundancy check);

a λ-tag extracting means for extracting said λ-tag included in the received packet from the main-ring and transferring the extracted packet to the routing means;

a λ-tag attachment means for attaching the λ-tag identifying the sub-ring having the destination terminal according to the address included in the packet to be transmitted;

a frame means for framing the packet to be suitable for transmission through the network; and

a light transmitter for converting an electrical packets into optical signals with the wavelength assigned to the sub-ring controller.

6. (Previously Presented) An internet protocol over WDM network structure according to claim 5, wherein said packet grouping means includes at least n number of buffers for storing the packets discriminated according to their destinations by said routing means.

7.-8. (Canceled)

9. (Previously Presented) The internet protocol over WDM network structure according to claim 1, wherein the main ring controller comprises:

a λ-tag delineator for delineating a destination sub-ring by extracting and reading information from the λ-tag added to the packets;

a λ-tag based switching section for routing the packets by their destination sub-rings according to the λ-tag;

at least n number of buffers, each buffer provided for a wavelength, respectively, for storing the packets distributed according to the destination from said λ-tag based switching section;

at least n number of lead frame sections for reading the packets from each of the buffers and restoring the λ-tag corresponding to said destination sub-ring, and framing the packet to be suitable for being transmitted; and

n number of the transmitters for converting the packets from each of said lead frame sections into optical signals wavelengths assigned to each transmitter.

10. (Currently Amended) The internet protocol over WDM network structure according to claim 1, wherein two or more of ~~the~~ a unit network comprise a main ring and a plurality of sub-rings connected to the main ring and constructed horizontally by connecting said main ring with another main ring by means of a gateway controller that performs transferring packets from a connection node belonging to said main ring to a connection node belonging to another main ring, and vice versa,

a transmitting part of said sub-ring controller adds to the packet to be transmitted to a sub-ring controller belonging to another main ring an identifying code (λ-tag) designating the connection node connected to the gateway controller, and then transmits it to a transmitting part of said main ring,

said gateway controller replaces the identifying code of said packet by an identifying code designating a receiving part of said sub-ring, and then transmits it to a receiving part of said main ring.

11. (Previously Presented) An internet protocol over WDM network structure according to claim 1, wherein a plurality of intermediate rings are inserted between the plurality of said sub-rings and the main ring, resulting in a three-layer structure, said intermediate ring having intermediate ring controllers for routing packets between two sub-rings belonging to the intermediating ring or between those belonging to different intermediate rings, respectively, through said main ring,

said sub-ring controller attaches the packet to the identifying code of the destination intermediate ring having a destination sub-ring and a second identifying code of said destination sub-ring belonging to the intermediate ring, and then transmits the extended packet with two identifying codes,

said intermediate ring controller confirms identifying code of the destination intermediate ring included in the extended packet transmitted from the source sub-ring, and if the identifying code indicates the intermediate ring as itself, then said intermediate ring controller confirms the identifying code of destination sub-ring, and then transmits said extended packet to the destination sub-ring having said destination terminal on the other hand, if the destination intermediate ring identifying code indicates another intermediate ring than itself, then it transmits said extended packet to said main ring, and

said main ring controller confirms the destination intermediate ring identifying code included in the extended packet transmitted from the source intermediate ring, and then transmits said extended packet to said intermediate ring having said destination terminal.

12.-16. (Canceled)

17. (Currently Amended) A method of transmitting/receiving packets in a sub-ring controller for controlling transmission/reception of the packets between any two of terminals, in an internet protocol over WDM network ~~including the~~ accommodating n number of terminals (where n is a positive integer) to which unique ~~user~~ wavelengths are respectively allocated, comprising the steps of:

dropping all packets flowing in the sub-ring of itself, to de-multiplex the packet, said ~~packet~~ packets transmitted from a source terminal and containing destination terminal addresses with a unique ~~user~~ wavelength of the source terminal;

routing the de-multiplexed packets by using the destination terminal addresses contained in the packets in order to delineate the packets by their destination terminal;

grouping the packets to be transmitted to each of the destination terminal by temporarily storing the packets in a buffer allocated to respective destination terminal; and

loading the grouped packets on ~~the assigned user~~ a unique wavelength assigned to the destination terminal and then transmitting the packets to the sub-ring, whereby said destination terminal receives said grouped packets by dropping only its assigned ~~user~~ wavelength among the packets that flow into the sub-ring,

wherein the sub-ring controller share information on IP addresses of all the terminals connected to whole network and wavelength allocated to the sub-ring to which its IP address belongs, and

wherein all the terminals connected to a given sub-ring communicate with corresponding sub-ring controller using different wavelengths.

18. (Canceled)

19. (Currently Amended) The method of transmitting/receiving packets according to claim 17, wherein a plurality of connection nodes ~~of sub-ring~~ connected via a main ring along which the wavelength division multiplexing signal transverses,

the method in said sub-ring controller for attaching an unique ~~user~~ wavelength information (λ-tag) designating ~~the~~ a destination sub-ring to the packet to be transmitted from its own sub-ring to other sub-ring to transmit the packet to said main ring, includes:

a λ-tag attachment step for attaching the λ-tag to designate the destination sub-ring, which will be used at the step of routing the packet in the main-ring controller;

a framing step for framing the packets with the λ-tag to make them suitable for being transmitted toward the main-ring controller;

a wavelength allocating step of loading the expanded packet on it own unique user wavelength; and

a light transmission step of converting the expanded packets into optical signals with assigned wavelength and for transmitting the optical signals to the main ring.

20. (Currently Amended) The method of transmitting/receiving packets according to claim 17, wherein a plurality of connection nodes ~~of sub-ring~~ connected via a main ring along which the wavelength division multiplexing signal transverses,

the method in said sub-ring controller for detaching the λ-tag from the packet received from said main ring to transmit the packet to the destination terminal, includes:

a light receiving step of receiving the unique ~~user~~ wavelength signal from said main ring;

a reframing step of synchronizing the received signal and for reading contents of the signal including CRC; and

a λ-tag detaching step of detaching the λ-tag to transmit the packet to the routing step.

21. (Previously Presented) The method of transmitting/receiving packets according to claim 19, wherein the main ring controller for receiving the extended packet to which the λ-tag is attached from the source sub-ring to transmit the packet to the destination sub-ring, includes:

a λ-tag delineation step of delineating the destination sub-ring using the λ-tag contained in the packets inputted;

a λ-tag based switching step of distributing the packets by their destinations according to the λ-tag of the destination sub-ring;

a buffering step of storing the packets distributed according to the destination sub-ring by said λ-tag based switching step into buffers;

a reframing step of reading the packets from the buffers and making them suitable for be transmitted to the destination sub-ring; and

a transmission step of converting the lead framed packets into optical signals with wavelengths allocated according to each of destination sub-rings.

22. (Currently Amended) An internet protocol over WDM network structure comprising:

~~the~~ n number of terminals (where n is a positive integer) to which unique ~~user~~ wavelengths are respectively allocated;

a single controller for controlling the flow of a packet transmitted between two terminals; and

a ring network for connecting said n number of terminals and said single controller in a ring shape, wherein wavelength division multiplexed signals are transmitted along said ring network,

wherein said terminals each add/drop only their own assigned ~~user~~ wavelength signals among the wavelength division multiplexed signals transmitted via said ring network, and

said controller drops all the wavelength division multiplexed signals transmitted via said ring network to de-multiplex the signals, routing the packets in the de-multiplexed wavelengths according to their designation terminals, using a destination terminal address included in the packets, and grouping the packets that have the same destination terminal, loads ~~each~~ the grouped packets on their assigned ~~user~~ wavelengths according to their destination terminals, and then multiplexes again said signals to transmit to said ring network,

wherein the controller share information on IP addresses of all the terminals connected to whole network and wavelength allocated to the ring network to which its IP address belongs, and

wherein all the terminals connected to the ring network communicate with corresponding controller using different wavelengths.

23. (Currently Amended) The internet protocol over WDM network structure according to claim 22, wherein any one terminal belonging to said ring network and any one terminal belonging to other ring network are connected, the same unique ~~user~~ wavelength is allocated to said two terminals, whereby as communication between said two ring networks are made possible via said two terminals, said ring networks are horizontally extended.

24. (Currently Amended) The internet protocol over WDM network structure according to claim 22, wherein said terminals includes a wavelength coupler for adding/dropping only its own assigned ~~user~~ wavelengths, said wavelength coupler passing other wavelengths.